DDF annual report

Title of Investigation:

NASA Robotics Internship Program

Principal Investigator:

Mr. David Rosage (Code 602)

Other In-house Members of the Team:

Dr. Lubna Rana (Code 602)

Other External Collaborators:

None

Initiation Year:

FY 2005

Aggregate Amount of Funding Authorized in FY 2004 and Earlier Years:

$0

Funding Authorized for FY 2005:

$20,000

Actual Expenditure of FY 2005 Funding:

Contract: $220,000, Infonetic, Inc.

Status of Investigation at End of FY 2005:

To be continued in FY 2006; transitioned to other NASA's Science Mission Directorate, National Space Grant, Recipient Projects

Expected Completion Date:

Expect to continue and expand to other NASA Centers

Purpose of Investigation:

This investigation allows students to work in the area of robotics, with minimal time involvement from the Principal Investigator (PI). This investigation will help the students to maintain their

interest in science, technology, engineering, and mathematics (STEM). And in doing so, they maintain an interest in robotics and inspire and prepare them as future robotics specialists. This investigation also promotes alliances with academic institutions and industry partners.

Accomplishments to Date:

Seven projects were awarded and 26 students participated in the 2005 program. The program ran from June 6–August 12, 2005. Each project was assigned a student team consisting of one *team lead* and up to three *research associates*. The PIs set the direction and oversaw week-to-week progress. *Team leads* provided technical guidance and managed the project on a daily basis. In addition to team projects (80 percent of time), interns participated in a group project (5 percent), attended public lectures, (10 percent), and went on field trips to robotics laboratories (5 percent). Titles of the seven projects were:

1. Visual Obstacle Identification Robotics
2. Adaptive Sensor Fleet
3. Development of Advanced Human-Robot Interfaces for CosmoBot
4. Development of Robotics Rover Prototypes to Assist Astronauts
5. Virtual Feel Robotic Servicing
6. Computer Vision for ANTS TetWalker
7. Modeling of Tetrahedral-based Robotics

Three field trips included:

- Robonaut Lab, Johnson Space Flight Center, Houston, TX
- Carnegie Mellon Robotics Institute, Pittsburgh, PA
- MIT Computer and Artificial Intelligence Laboratory, Boston, MA

In addition, four public lectures were held. They included:

- *"The Challenges and Excitement of Space Robotics: Exploring the Solar System,"* Dr. Paul Schenker, Manager, Robotic Space Exploration Technologies Program NASA Jet Propulsion Laboratory
- *"Testing Space Robots on Earth,"* Dr. Butler Hine, Director, Exploration Office, NASA Ames Research Center
- *"Intelligent Robots: R2-D2 to Spirit, Opportunity and Beyond,"* Dr. Vijay Kumar, UPS Foundation Professor, University of Pennsylvania
- *"Learning From Nature to Build Robots That Can See and Walk,"* Dr. Ralph Etienne-Cummings, Computational Sensory-Motor Systems Lab, Department of Electrical and Computer Engineering, Johns Hopkins University

In addition, seven professionals associated with robotics shared an evening with the students at the Robotics House located at the University of Maryland. They included:

1. Anngienetta Johnson, NASA Headquarters
2. Orlando Figueroa, NASA Headquarters
3. Dave Lavery, NASA Headquarters
4. Ken Hinkle, Goddard Space Flight Center
5. Vladimir Lumelsky, Goddard Space Flight Center
6. Frank Cepollina, Goddard Space Flight Center
7. John Vranish, Goddard Space Flight Center

The pilot project ended within budget and met all success criteria defined in the original proposal.

Planned Future Work:

Hold second-year pilot at Goddard with a few minor improvements, plus expand to Ames Research Center, which will host three teams in 2006. the new program name will be NASA Robotics Academy

Key Points Summary:

Project's innovative features: Some of the program's innovative features are: 1) allowed the students to work in teams; 2) promoted and created partnerships between NASA, academia, and industry; 3) encouraged the interest of college freshmen and sophomore students to help prepare future robotics specialists; and 4) engaged and educated students through public robotics lectures.

Potential payoff to Goddard and NASA: The students produced significant R&D work at a lower rate. This allowed us to save money.

The criteria for success:1) How well the program performed on each of the six NASA Education Operating Principles; 2) The added value to R&D efforts at NASA and other participating institutions; 3) The impact on the students' academics and career choices.

Technical risk factors: One of the technical risk factors is the skepticism of having freshman/sophomore students in the program.